STUDIES ON AUSTRALIAN CAINOZOIC BRACHIOPODS 5. THE GENERA *VICTORITHYRIS* ALLAN AND *DIEDROTHYRIS* NOV.

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Abstract

The genus *Victorithyris* is redefined and the species *V. peterboroughensis*, *V. garibaldiana*, *V. divaricata* and *V. tateana* redescribed. A new genus, *Diedrothyris*, is erected to include *Magellania johnstoniana* and *M. furcata* which are redescribed and a new species *D. plicata*.

Introduction

Victorithyris and *Diedrothyris* contain species occurring in Australian Tertiary deposits. They include all the Australian Tertiary species attributed previously to *Magellania*. *Magellania* now contains Recent species from Antarctica, South America, and one from Australia, *Magellania flavescens* (Foster, 1974; Stewart, 1976).

These three genera have similar external features—sculpture, folding, shape, and beak structures. *Magellania* and *Victorithyris* possess the same type of cardinalia (fused socket ridges and crural bases and inner hinge plates only) and differ primarily in that the hinge plates are solid in *Victorithyris*, lamellar and excavate in *Magellania*. The elements of the cardinalia of *Diedrothyris* are lamellar but their form is similar to those Australian and New Zealand species Thomson (1918) attributed to *Stethothyris*, that is, with separate crural bases and socket ridges and inner and outer hinge plates.

All the material described is contained in the collections of the Palaeontology Department, National Museum of Victoria (NMV-P) or in the Ralph Tate Collection, South Australian Museum (SAM-T).

Genus **Victorithyris** Allan, 1940

Type-species: Victorithyris peterboroughensis Allan, 1940, by original designation.

Diagnosis: Anterior commissure sulcate to intraplicate; deltidial plates fused; foramen permesothyrid. Cardinalia with fused socket ridges and crural bases, thickened inner hinge plates meeting on the septum to form a shallow, central trough. Loop teloform.

Stratigraphic range and distribution: Australia: Late Eocene to late Miocene.

Comments: Allan (1940) erected *Victorithyris* for—"Smooth Neothyrinae with permesothyrid foramen, sulcate to intraplicate anterior commissure, magellaniform loop and cardinalia of the *Stethothyris* type" (p. 289). Allan referred to this genus the new species *V. peterboroughensis* and two species, *Magellania pectoralis* and *Magellania sufflata*, which Thomson (1918) had placed in *Stethothyris*. Allan stated that these latter species form "a fairly complete morphological sequence" (p. 293). However, studies of growth stages of the cardinalia of these species demonstrates that they are more closely related to *Stethothyris* than to *Victorithyris*. *In V. peterboroughensis* the socket ridges and crural bases are fused so that inner hinge plates only are present; in *M. pectoralis* and *M. sufflata* there is no fusion of these structures and the crural bases separate inner and outer hinge plates. Accordingly, *M. pectoralis* and *M. sufflata* are returned to the genus *Stethothyris*.

Victorithyris differs from *Magellania* in foraminal position and in the thickness of the components of the cardinalia. *Magellania* is mesothyrid with sulcate folding and lamellar cardinalia; *Victorithyris* is permesothyrid with sulcate to intraplicate folding and thickened cardinalia in adult forms. *Magellania garibaldiana, M. divaricata* and *M. tateana* display the foraminal position, folding, and characteristic cardinalia of *V. peterboroughensis*. They are therefore transferred to *Victorithyris*. *Vic-*

torithyris tateana is distinguishable in size, in outline and in beak length from the other three species and is restricted to Late Eocene sediments. *Victorithyris peterboroughensis, V. garibaldiana* and *V. divaricata* are a closely related group from the Miocene of southern Australia. *Victorithyris garibaldiana* and *V. peterboroughensis* may be distinguished primarily on presence or absence of plicae and there is a tendency for the plicate species *V. garibaldiana* to display a smaller foramen and a more erect beak than *V. peterboroughensis*. However, the plicae are faint in many specimens of *V. garibaldiana* and in one collection attributed to *V. peterboroughensis* slight plication is evident. Collections of these two species also show similar wide ranges of variation in external features and, in both species, a broadly ovate to subcircular outline is associated with strong folding and a shallowly convex dorsal valve; an ovate outline is associated with moderate or slight folding and a dorsal valve of equal or nearly equal convexity to that of the ventral valve. *Victorithyris garibaldiana* is the dominant brachiopod species in the River Murray Cliffs, *V. peterboroughensis* dominates the Port Campbell Limestone.

A more detailed study of the distribution of the variants of these species would be rewarding. The two species probably arose from a common ancestor in Oligocene or early Miocene times. The large shallow benthic areas of the Murray and Port Campbell Basins apparently provided an environment promoting abundance and diversification. The pattern of variation described above is similar to that evident in populations of living *Magellania flavescens* from different bays of south-eastern Australia (Stewart, 1976). In the Miocene the plicate form (*V. garibaldiana*) came to be characteristic of the Murray River area, the smooth (*V. peterboroughensis*) of the Port Campbell region.

Victorithyris Peterboroughensis Allan, 1940
(Plate 9, figures 1-24)

Victorithyris peterboroughensis Allan, 1940, p. 291, pl. 35, fig. 6, pl. 37, figs. 4-6.

Description: Maximum observed length 44 mm. Outline ovate to subcircular; biconve, ventral valve strongly convex, dorsal valve moderately convex to flattened with median sulcus extending from the umbonal area. Anterior commissure sulcate to slightly intraplicate; lateral commissures sinuate; cardinal margin moderately curved. Beak suberect to nearly erect.

Dorsal valve with socket ridges and crural bases fused, thick; hinge plates solid, fused laterally with the bases of combined socket ridges and crural bases, medially with each other and the median septum, the median line of fusion visible as a narrow groove, anterior border of hinge plates V-shaped, the median tip being fused with the crest of the septum. Median septum, high, extending approximately the posterior third of total valve length, tapering abruptly anteriorly, thick at line of attachment to valve, free edge sharp. Cardinal process linguiform, posterior surface slightly concave, transversely striated; anterior surface with slightly swollen rim, sloping sharply backwards to fuse with the posterior limits of the hinge plates. Pallial sinuses and adductor muscle scars deeply impressed; anterior adductor scars elongate, flanking anterior half of septum; posterior adductors, elongate, running obliquely from the posterior limit of the septum to the mid-point of the lateral borders of the anterior adductor scars.

Ventral valve with thin shell, lateral walls slightly thickened below small, elongate-ovate hinge teeth; muscle scars not apparent.

Types: National Museum of Victoria—Holotype NMV P15398 (length 30 mm, breadth 23 mm, depth 17 mm); nine hypotypes NMV P52645-52653 from the type locality, collected by E. D. Gill, 19.9.52.

Type locality: Port Campbell Limestone; sea cliffs near monument Peterborough, Victoria (Bairnsdalian).

Stratigraphic range: Bairnsdalian to Cheltenhamian (mid-late Miocene).

Occurrence: South Australia—Bookpurnong Beds (Cheltenhamian): —River Murray Cliffs

south side, 4 km downstream from Loxton.
Victoria—Port Campbell Limestone (Bairnsdalian):—sea cliffs near monument, Peterborough; Two Mile Beach, Port Campbell, top of cliffs at Point Hesse; Hennessy's Steps, top of cliffs 1.6 km east of Sherbrook River; Keilambete; Hopkins River estuary, west bank near Warrnambool; Bay of Islands.
Rutledge's Creek Beds (Bairnsdalian):—Rutledge's Beach, bottom 3.5 m of cliffs; mouth of Rutledge's Creek; Amphitheatre, mouth of Ingle's Creek, 6-15 m above sea level; Sherbrook.
Glenample Clay (Bairnsdalian):—east of Gibson's Steps, Port Campbell Coast; top of cliffs, Gravel Point, 0.8 m west of Gibson's Steps.
Fyansford Clay (Bairnsdalian):—Warrambine Creek, downstream from bridge, near Inverleigh.
Fyansford Formation (Bairnsdalian):—North Shore, Corio Bay.
Tambo River Formation (Mitchellian):—Swan Reach, Tambo River, Gippsland.

Remarks: The holotype with a length of 30 mm is a small adult (Pl. 9, figs. 16-18) consequently illustrations of a larger, more representative, specimen are given here (Pl. 9, figs 7-11).

Specimens attributed to *V. peterboroughensis* from the localities cited above vary in outline, convexity, folding and beak position. Collections from different localities show different ranges of variation in these characters. Attempts to group collections with similar ranges of variation result in the formation of an apparently continuous morphological series with the faunas from Rutledge's Creek Beds at one limit and those from Bookpurnong Beds at the other. Between these two lie the Port Campbell Limestone faunas. Other localities placed in relation to these groups are noted below although some of these are not represented by large numbers of specimens. However, a provisional grouping of this type gives some basis for the further study of faunas in relation to strata (Table 1).

The few intact specimens collected from the Bookpurnong Beds all display plication of late inception near the anterior and lateral margins of the valves. The only character clearly separating *V. peterboroughensis* and *V. garibaldiana* is the presence of plicae in the latter species. Consequently the attribution of these specimens to *V. peterboroughensis* is made with some doubt; from the existing collection they appear more similar to specimens of *V. peterboroughensis* from Swan Reach and Corio Bay than they are to specimens of *V. garibaldiana* from any locality.

Victorithyris Garibaldiana (Davidson, 1862)
(Plate 10, figures 1-15)

Terebratula sp. Sturt, 1833, p. 254, pl. 3, fig. 15.
Terebratula compta Tenison-Woods, 1862, p. 74, woodcut; *non Terebratula compta* Sowerby, 1845.
Waldheimia garibaldiana Davidson, 1862, p. 446, pl. 24, fig. 9.
Waldheimia imbricata Tenison-Woods, 1865, p. 2, figs 3a-b.
Waldheimia garibaldiana: Etheridge, 1876, pp. 17, 18, pl. 1, figs. 2a, b.
Waldheimia macropora McCoy, 1877, pl. 43, figs. 4, 6.
Waldheimia garibaldiana: Tate, 1880, pp. 146-148, pl. 11, figs 1a-e.
Magellania garibaldiana: Tate, 1899, pl. 252.
Magellania garibaldiana: Thomson, 1927, p. 295.

Description: Maximum observed length 48 mm. Outline ovate to subcircular; biconvex, ventral valve strongly convex with two longitudinal ridges bordering median sulcus, dorsal valve convex to flattened, degree of convexity of the valve being associated with extent and depth of the sulcus, in moderately convex forms the sulcus slight and confined to anterior third of valve, in nearly plane forms sulcus deeper and extending nearly to umbo. Plication, coarse, variable in prominence; in general, marked in bioconvex specimens with ovate outlines and moderate folding, less prominent in those of broader outline, flatter dorsal valves and stronger folding. Anterior commissure sulcate to intraplicate; lateral commissures straight posteriorly, sharply inflected at borders of anterior sulcus; cardinal margin moderately to

TABLE 1

Geographical variants of *Victorithyris peterboroughensis*.

Formation or Locality	Age	External Characters				
		Plicate	Outline	Convexity of dorsal valve	Folding	Beak
Bookpurnong Beds	Cheltenhamian	slight	ovate	moderate	sulcate	erect
Swan Reach	Mitchellian					
Corio Bay	Bairnsdalian	none	ovate	moderate	sulcate	sub-erect to erect
Keilambete	Bairnsdalian					
Fyansford Clay	Bairnsdalian	none	ovate	slight to moderate	sulcate	sub-erect to erect
Hopkins River	Bairnsdalian					
Port Campbell Limestone	Bairnsdalian	none	ovate to broadly ovate	slight to moderate	sulcate	sub-erect to erect
Glenample Clay	Bairnsdalian	none	ovate to broadly ovate	slight	sulcate to intra-plicate	sub-erect
Rutledge's Creek Beds	Bairnsdalian	none	broadly ovate	slight to flat	strongly sulcate to intra-plicate	sub-erect

strongly curved. Broad shell outline and intraplicate folding generally associated with larger specimens (length range 35-40 mm). Beak suberect to erect; foramen small.

Types: British Museum (Natural History)—Holotype B4982; National Museum of Victoria—Syntype NMV P12183 of *Waldheimia macropora* McCoy, Flemington, Victoria; seven hypotypes (NMV P52654-52660) from the Morgan Limestone, Murray River Cliffs, collected by F.A. Cudmore.

Type locality: Mount Gambier Limestone (Longfordian) Mount Gambier, South Australia.

Stratigraphic range: Longfordian to Cheltenhamian (early to late Miocene).

Occurrence: South Australia—Morgan Limestone, Lower Member (Longfordian), Murray River Cliffs. Morgan Limestone, Cadell Marl Lens (Balcombian), Murray River Cliffs. Morgan Limestone, Upper Member (Balcombian), Murray River Cliffs.
Mount Gambier Limestone (Longfordian), Mount Gambier.
Tasmania—Freestone Cove Sandstone (Longfordian), Table Cape.
Victoria—Bairnsdale Limestone (Bairnsdalian): Neumerella, Drier's lower beds, Mitchell River, Pound Swamp, Mitchell River.
Balcombe Clay (Balcombian):—Balcombe Bay; Grice's Creek; Mount Eliza.
Fyansford Formation (Balcombian):—Orphanage Hill, Geelong; Red Hill, Shelford.
Gellibrand Marl (Batesfordian):—cutting on Bornong Road, north of Cooriemungle Road.
Gippsland Limestone (Bairnsdalian):—railway cutting 1.6 km west of Orbost.
Muddy Creek Marl (Balcombian):—Clifton Bank, Muddy Creek.
Puebla Clay (Longfordian):—Birregurra, left

bank Barwon River.
Sandringham Sands (Cheltenhamian):—Beaumaris.

Remarks: Davidson (1862) erected the species from a specimen believed to have been collected from the Tertiary beds of Malta. Subsequently Etheridge (1876) noted that Davidson himself was satisfied (from an examination of the matrix filling the valves) that the specimen came from the coralline Limestone of Mount Gambier, South Australia. In 1880 Tate reviewed the species and referred to it a large collection of specimens from the River Murray Cliffs. Tate noted the variablity of this collection and placed in the synonymy of *V. garibaldiana* three species, all with characters lying within the range of variation of the collection from the River Murray Cliffs. *Terebratula* sp. Sturt from the Murray River and *Waldheimia imbricata* Tenison-Woods from Mount Gambier were considered by Tate to be adolescent forms while the type of *Waldheimia macropora* McCoy from Flemington, Victoria, displays a form common in collections from the River Murray Cliffs. Tenison-Woods (1878) referred specimens collected at Table Cape, Tasmania to *W. imbricata*. These specimens are presumed to have been lost but Tenison-Wood's illustrations bear a similarity to the new species *Diedrothyris plicata* although *V. garibaldiana* also occurs at Table Cape.

Only one broken specimen from the type locality is available in the collections of the National Museum of Victoria and the South Australian Museum, consequently the species is redescribed from material collected by F. A. Cudmore from the Murray River Cliffs. Specimens in this collection resemble closely Davidson's and Etheridge's illustrations of the species. The Murray River Cliffs are the most prolific sources of *V. garibaldiana*. Collections from some beds in these cliffs are characterised by a wider range of variation in external features than is known from other localities. Further collections need to be made in this area for any relationship between variation and different strata to be established. F. A. Cudmore's collections from the Lower Member of the Morgan Limestone show the full range of variation described for the species while specimens in collections from the Cadell Marl Lens and the Upper Member are broadly ovate with a flattened dorsal valve and pronounced folding. The other extreme in the range of variation noted for the species (narrowly ovate outline, convex dorsal valve, slight folding) characterises specimens from a lower horizon, the Mannum Formation—they are attributed to *V. divaricata*.

Collections of *V. garibaldiana* from other localities cited are generally too small to give ranges of variation. Some, however, show sufficient consistency to be noteworthy, for example those specimens obtained from Beaumaris, Victoria, are relatively small in size (maximum observed length 25 mm) with slightly convex valves and plicae confined to the valve margins; specimens from Table Cape, Tasmania, all display prominent multiplication extending from the umbo to the valve margins.

Victorithyris divaricata (Tate, 1880)
(Plate 10, figure 16)

Waldheimia (?) divaricata Tate, 1880, p. 149, pl. 8, figs. 8a-b.

Types: South Australian Museum—Lectotype T868E (length 26 mm, breadth 20 mm, depth 13 mm), Tate's figure 8, Paralectotypes T868A-D, F, G, Ralph Tate Collection.

National Museum of Victoria—Hypotype NMV P52661 F. A. Cudmore Collection.

Type locality: Mannum Limestone (early Miocene); red raggy limestone, Mannum, River Murray, South Australia.

Stratigraphic range: Early Miocene.

Occurrence: South Australia—Mannum Formation (early Miocene):—lower beds at Swan Reach, Wongulla and Morgan to Mannum, River Murray Cliffs.

Remarks: Tate (1880) noted the similarity between *V. divaricata* and *V. garibaldiana* but considered that the former species displayed a narrow shell, a less inflated dorsal valve,

broader deltidial plates and more conspicuous beak ridges than *V. garibaldiana.* These external features are evident in some specimens from the highly variable collections of *V. garibaldiana* from the white calcareous beds near Morgan (Tate's references, Bed No. 9). Consequently the two species differ in their ranges of variation, that of *V. garibaldiana* being wide and incorporating the narrower range of variation apparent in collections of *V. divaricata. V. divaricata* is retained with doubt and until further collections are made from the River Murray Cliffs.

Victorithyris tateana (Tate, 1880)
(Plate 11, figures 1-8)

Waldheimia tateana Tate, 1880, p. 150, pl. 7, figs 6 a-b, pl. 8, fig. 6a-c, pl. 9, fig. 2.
Magellania tateana Tate, 1899, p. 253.

Description: Small to moderate in size (maximum observed length from the type locality, 24 mm); outline narrowly ovate to pyriform; anterior commissure sulcate or slightly intraplicate, the folding of late inception, specimens less than 20 mm in length being rectimarginate or shallowly sulcate; lateral commissures rectimarginate; cardinal margin strongly curved; beak suberect, foramen small. Dorsal and ventral valve interior structures agree with those of the type species.

Types: South Australian Museum—Lectotype SAM T906J, Paralectotypes T906A-H, Ralph Tate Collection.

National Museum of Victoria—Hypotypes, NMV P52662, P52663, F. A. Cudmore Collection.

Type locality: Tortachilla Limestone (Aldingan): Maslin Bay, Aldinga, South Australia.

Stratigraphic range: Aldingan (late Eocene-early Oligocene).

Occurrence: South Australia—Tortachilla Limestone; Port Noarlunga; Stansbury on Yorke Peninsula; Aldinga Bay.
Victoria—Castle Cove Limestone:—Wilkinson's Locality 5, Grid No. 307162; Calder River Limestone:—anticline on Aire Coast, near Middle Beach, Glen Aire.
Glen Aire Clays:—Wilkinson's reference Locality 1, Point Flinders, Cape Otway.

Remarks: The largest collection of specimens available (total 47) is from the type locality. Other localities cited are represented by less than ten, usually broken, specimens, consequently differences may exist between populations which are not apparent in such small samples.

Diedrothyris gen. nov.

Derivation: diedros Gr. = sitting apart.

Type species: *Waldheimia (?) johnstoniana,* Tate, 1880

Diagnosis: Anterior commissure rectimarginate to sulcate to intraplicate; deltidial plates, short, fused; foramen mesothyrid; shell commonly plicate. Cardinalia with crural bases separating excavate inner and outer hinge plates. Loop teloform.

Stratigraphic range and distribution: Australia. Late Eocene-mid Miocene.

Comments: The species now assigned to *Diedrothyris* were formerly included in the genus *Waldheimia = Magellania.* These species resemble *Magellania* in external features, i.e., plication, curvature of the cardinal margin, beak and foraminal condition, but differ from the genus in the possession of outer hinge plates. In *Magellania* the socket ridges and crural bases are fused and excavate, inner hinge plates extend from them medially to fuse on top of the septum. In *Diedrothyris* the crural bases separate inner and outer hinge plates, the outer hinge plates lying between the socket ridges and the crural bases. *Stethothyris* displays a similar cardinalia pattern. However, in this genus the hinge plates are solid in adult forms and plication seen to some degree in all members of *Diedrothyris,* is absent. Furthermore, the Australian members of *Stethothyris* display a small, permesothyrid foramen with an erect to

incurved beak. Species included in *Diedrothyris* display a suberect beak and a foramen of moderate size which is mesothyrid. Other species showing affinities with *Diedrothyris* are *Magellania joubini* Blochmann and *Magellania fragilis* Smith. In these species crural bases separate inner and outer hinge plates and the loop is teloform. Externally, *Diedrothyris furcata* is almost indistinguishable from *Gyrothyris mawsoni* Thomson while *Diedrothyris plicata* is similar to *Magellania flavescens.*

The three species assigned to *Diedrothyris* differ externally in folding and plication, internally in the shape of the cardinal process and in the position at which the inner hinge plates lies in relation to the crural bases. The cardinal process is rectangular in outline in *D. johnstoniana* and *D. furcata;* in *D. plicata* the cardinal process is narrow and transverse. The hinge plates and the crural bases form a level horizontal platform in *D. johnstoniana* and *D. plicata;* in *D. furcata* the socket ridges are elevated and the hinge platform medially depressed owing to the fact that inner hinge plates extend medially from the lower and not the upper borders of plate-like crural bases. With respect to the folding of the anterior commissure, *D. furcata* is rectimarginate, *D. johnstoniana* varies from rectimarginate to sulcate to intraplicate, and *D. plicata* from sulcate to intraplicate. The valves of *D. furcata* and *D. plicata* are entirely plicate; in *D. johnstoniana* the plicae are confined to the margins of the anterior halves of the valves.

Diedrothyris johnstoniana (Tate, 1880)
(Plate 11, figures 9-16)

Waldheimia (?) johnstoniana Tate, 1880, p. 151, pl. 8, figs 9a-b.
Waldheimia (?) fimbriata Tate, 1880, pp. 150-151, pl. 8, figs 2a-b.

Magellania johnstoniana: Tate, 1899, p. 253.

Magellania (?) fimbriata: Tate, 1899, p. 252.

Magellania (?) fimbriata: Thomson, 1927, p. 295.

Description: Maximum observed length 29 mm. Outline subpentagonal, anterior margin straight, greatest width at mid-length; biconvex, ventral valve deeper. Plication coarse, variable in prominence, restricted to anterior regions only. Anterior commissure intraplicate; lateral commissures straight; cardinal margin strongly curved. Beak short, suberect.

Socket ridges, low, moderately stout, converging slightly posteriorly to fuse with dorsal umbo borders. Crural bases linear posteriorly, widening and diverging slightly anteriorly. Outer hinge plates excavate, narrow, fused laterally with socket ridges, medially with crural bases. Inner hinge plates, excavate, fused laterally with crural bases, medially with each other and crest of median septum, anterior border deeply V-shaped. Median septum blade-like, short. Cardinal process small, rectangular in outline. Muscle and pallial impressions not visible.

Ventral valve with thin shell; rectangular hinge teeth without swollen bases. Muscle impressions not visible.

Types: South Australian Museum—Lectotype T867A, Paralectotypes T867B-F, T871A-H, J. Ralph Tate Collection.

National Museum of Victoria—Hypotypes P52664-P52665, collection of J. R. Richardson.

Type locality: Tortachilla Limestone (Aldingan): Maslin Bay, Aldinga, South Australia.

Stratigraphic range: Aldingan (late Eocene).

Remarks: Tate's species *Waldheimia fimbriata* and *W. johnstoniana* agree in all internal and external features except size, outline, and the prominence and extent of plication. Collections made at the type locality of both species (Tortachilla Limestone, Maslin Bay, Aldinga, S. A.) show that the two species are linked by a series of intermediate forms and that the specimens designated *W. fimbriata* are juvenile forms of *W. johnstoniana.*

The specimen of *W. fimbriata* figured by Tate (No. T871B, in the Tate Collection, South Australian Museum) is the largest (23 mm in length) specimen in his collection of nine syntypes. This specimen is ovate in outline with prominent anterior plication (which does not extend beyond the mid-length of the valves) and

with a rectimarginate anterior commissure. The remaining syntypes vary in the prominence and extent of plication and in the folding of the anterior commissure. The prominent and regular plication displayed in Tate's syntype (Tate, 1880, pl. 8, figs 2a-b) is not characteristic of these specimens in which the sculpture is more in the nature of irregularly spaced plicae confined to the areas immediately adjacent to the margins of the valves. The anterior commissure varies between rectimarginate and slightly intraplicate. The lectotype of *D. johnstoniana* (pl. 11, figs 15-16) is 6 mm longer than the figured syntype of *D. fimbriata* and the former species is subpentagonal in outline. However it is apparent from the growth lines on this specimen of *D. johnstoniana* that, at a growth stage of a size equivalent to that of *D. fimbriata,* it displayed an ovate outline.

Diedrothyris furcata (Tate, 1880)
(Plate 11, figures 17-19)

Waldheimia furcata Tate, 1880, pp. 148-149, pl. 7, figs 2a-b.
Magellania furcata Tate, 1899, p. 252.

Magellania furcata: Thomson, 1927, p. 295.

Description: Maximum observed length 22 mm. Outline ovate; biconvex. Multiplicate, plicae arising immediately anterior to umbo, anteriorly plicae widen and bifurcate. Lateral and anterior commissures straight; cardinal margin strongly curved. Beak short, suberect; foramen small.

Socket ridges elevated, moderately stout, converging slightly posteriorly to fuse with dorsal umbo borders. Crural bases, narrow vertical plates, separating inner and outer hinge plates. Outer hinge plates, excavate, fused laterally with bases of socket ridges, medially with upper borders of crural bases. Inner hinge plates, excavate, fused laterally with lower borders of crural bases, medially with each other and the crest of the median septum; anterior border deeply V-shaped. Cardinal process small, rectangular, posterior border attached to umbo, lateral and anterior borders free. Muscle and pallial impressions not visible. Ventral valve interior as for type-species.

Types: South Australian Museum—Lectotype T865A (length 22 mm, breadth 18 mm, depth 15 mm), paralectotypes T865B-E, Ralph Tate Collection.

National Museum of Victoria—Hypotype, P52666, collection of J. R. Richardson.

Type locality: Port Willunga Formation, south of Port Willunga, Aldinga, South Australia.

Stratigraphic range: Late Oligocene to early Miocene.

Occurrence: Formation unknown:—Surveyor's Point, Yorke Peninsula, South Australia.

Diedrothyris plicata sp. nov.
(Plate 11, figures 20-25)

Magellania garibaldiana Pritchard, 1910, p. 90, fig. 20.
non Victorithyris garibaldiana (Davidson, 1862)

Magellania garibaldiana: Gill and Baker, 1955, pp. 39-43, pl. 1, fig. 1.
non Victorithyris garibaldiana (Davidson, 1862)

Derivation: plicatus L. = folded

Description: Maximum observed length 32 mm. Outline subpentagonal, greatest breadth slightly anterior to mid-length; unequally biconvex, ventral valve deeper and carinate, dorsal valve slightly depressed medially by shallow anterior sulcus. Multiplicate, two primary plicae lying within the dorsal valve sulcus and the ventral carina; four primary plicae on lateral commissure sinuate; cardinal margin strongly curved. Foramen, large; beak suberect. Muscle and pallial impressions not visible.

Socket ridges low, converging posteriorly to fuse with dorsal umbo anteriorly overhanging triangular sockets, laterally fused with outer hinge plates, the two structures forming gently sloping surfaces. Crural bases, vertical plates, diverging anteriorly; outer and inner hinge

plates attached to upper borders so that the three structures form a T-shaped cross-section, the vertical formed by crural bases, outer and inner hinge plates forming each side of horizontal. Hinge plates, lamellar, excavate, almost horizontal; inner hinge plates fused medially within median septum; anterior border low V-shape. Cardinal process narrow, transverse. Muscle and pallial impressions not visible. Ventral valve as for type-species.

Types: National Museum of Victoria—Holotype, P17366 (length 27 mm, breadth 19 mm, depth 15 mm); paratypes P173677-8, F. A. Cudmore Collection; Hypotypes P15324, Pritchard Collection; P16826, E. D. Gill Collection; P12183, McCoy Collection.

Type locality: Freestone Cove Sandstone (early Miocene); Lower beds, Table Cape, Tasmania. Stratigraphic range: Late Oligocene to middle Miocene.

Occurrence: Tasmania—Cape Grim Beds (early Miocene):—Cape Grim.
Victoria—Batesford Limestone (early Miocene):—Batesford Filter Quarries.
Muddy Creek Marl (middle Miocene):—Clifton Bank, Muddy Creek.
Point Addis Limestone (late Oligocene):—Airey's Inlet, Waurn Ponds.
Formation unknown (middle Miocene):—Cr. Hoffman Road and Buckley Street, Aberfeldie; Flemington; Royal Park Railway Cutting, Melbourne.

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Explanation of Plates

PLATE 9

Victorithyris peterboroughensis Allan

Figs. 1-5— Hypotype P52649, dorsal, ventral, lateral, anterior and posterior views, ×0.75. Rutledge's Creek Beds. Rutledge's Beach. Bottom 3.5 m of cliffs, Victoria.

Fig. 6— Hypotype P52650, dorsal interior, ×1.5. Rutledge's Creek Beds. Rutledge's Beach, bottom 3.5 m of cliffs, Victoria.

Figs. 7-11— Hypotype P52645, dorsal, ventral, lateral, anterior and posterior views, ×1. Port Campbell Limestone, sea cliffs near monument, Peterborough, Victoria.

Fig. 12— Hypotype P52646, dorsal interior, ×2. Port Campbell Limestone, sea cliffs near monument, Peterborough, Victoria.

Fig. 13 — Hypotype P52647, dorsal interior, ×4. Port Campbell Limestone, sea cliffs near monument, Peterborough, Victoria.

Fig. 14 — Hypotype P52648, dorsal interior, ×2. Port Campbell Limestone, sea cliffs near monument, Peterborough, Victoria.

Fig. 15 — Hypotype P52653, dorsal interior, ×2. Port Campbell Limestone, sea cliffs near monument, Peterborough, Victoria.

Figs. 16-18 — Holotype P15298, dorsal, lateral and anterior views, ×1.2. Port Campbell Limestone, sea cliffs near monument, Peterborough, Victoria.

Figs. 19-23 — Hypotype P52651, dorsal, ventral, lateral views, anterior and posterior views, ×1. Bookpurnong Beds, south bank, River Murray, downstream from Loxton, South Australia.

Fig. 24 — Hypotype P52652, dorsal interior, ×1.5. Bookpurnong Beds, south bank, River Murray, 4 km downstream from Loxton, South Australia.

PLATE 10

Victorithyris garibaldiana (Davidson)

Fig. 1 — Hypotype P52654, dorsal view ×0.9. Morgan Limestone, Upper Member, hard yellow limestone, Tate's reference beds, Nos 3-5, Murray River Cliffs, South Australia.

Fig. 2 — Hypotype P52654, ventral view, ×1. Morgan Limestone, Upper Member, hard yellow limestone, Tate's reference beds, Nos 3-5, Murray River Cliffs, South Australia.

Figs. 3-5 — Hypotype P52654, lateral, anterior and posterior views, ×1. Morgan Limestone, Upper Member, hard yellow limestone, Tate's reference beds, Nos 3-5, Murray River Cliffs, South Australia.

Figs. 6-10 — Hypotype P52655, dorsal, ventral, lateral, anterior and posterior views, ×1. Morgan Limestone, Upper Member, hard yellow limestone, Tate's reference beds, Nos 3-5, Murray River Cliffs, South Australia.

Fig. 11 — Hypotype P52656, dorsal views, ×1. Morgan Limestone, Upper Member, hard yellow limestone, Tate's reference beds, Nos 3-5, Murray River Cliffs, South Australia.

Fig. 12 — Hypotype P52657, dorsal view, ×1. Morgan Limestone, Upper Member, hard yellow limestone, Tate's reference beds, Nos 3-5, Murray River Cliffs, South Australia.

Fig. 13 — Hypotype P52659, dorsal view, ×1. Morgan Limestone, Upper Member, hard yellow limestone, Tate's reference beds, Nos 3-5, Murray River Cliffs, South Australia.

Fig. 14 — Hypotype P52658, dorsal view, ×1. Morgan Limestone, Upper Member, hard yellow limestone, Tate's reference beds, Nos 3-5, Murray River Cliffs, South Australia.

Fig. 15 — Hypotype P52660, dorsal interior view, ×1. Morgan Limestone, Upper Member, hard yellow limestone, Tate's reference beds, Nos 3-5, Murray River Cliffs, South Australia.

Victorithyris divaricata (Tate)

Fig. 16 — Hypotype P52661, dorsal view, ×1.5. Mannum Limestone, red raggy limestone, Mannum, Murray River Cliffs, South Australia.

PLATE 11

Victorithyris tateana (Tate)

Figs. 1-2 — Lectotype T9064, dorsal and lateral views, ×1.5.

Figs. 3-4, 6-8 — Hypotype P52662, dorsal, ventral, lateral, anterior and posterior views, ×1.5. Tortachilla Limestone, Maslin Bay, Aldinga, South Australia.

Fig. 5 — Hypotype P52663, dorsal interior view, ×2.3. Tortachilla Limestone, Maslin Bay, Aldinga, South Australia.

Diedrothyris johnstoniana (Tate)

Figs. 9-13 — Hypotype P52664, dorsal, ventral, lateral, anterior and posterior views, ×1.6. Tortachilla Limestone, Maslin Bay, Aldinga, South Australia.

Fig. 14 — Hypotype P52665, dorsal interior view, ×2. Tortachilla Limestone, Maslin Bay, Aldinga, South Australia.

Figs. 15-16 — Lectotype T867A, dorsal and lateral views, ×1.2.

Diedrothyris furcata (Tate)

Figs. 17-18 — Lectotype T865A, dorsal and lateral views, ×1.5. Port Willunga Formation, south of Port Willunga, Aldinga, South Australia.

Fig. 19 — Hypotype P52666, dorsal interior view, ×2.2. Port Willunga Formation, south of Port Willunga, Aldinga, South Australia.

Diedrothyris plicata sp. nov.

Figs. 20-22 — Holotype P17366, dorsal, ventral, lateral views, ×1.3. Freestone Cove Sandstone, lower beds, Table Cape, Wynyard, Tasmania.

Fig. 23 — Paratype P17367, dorsal interior view, ×3. Freestone Cove Sandstone, lower beds, Table Cape, Wynyard, Tasmania.

Figs. 24-2 — Holotype P17366, anterior and posterior views, ×1.3. Freestone Cove Sandstone, lower beds, Table Cape, Wynyard, Tasmania.